Calculus Warm Up #3-5

No warm up today.
(Turn it in)

New team #

HW Questions

Quiz

Review WS for HW

HW Questions: p. 134

In Exercises 1–6, complete the table using Example 2 as a model.

$y = f(g(x))$	$u = g(x)$	$y = f(u)$

2. $y = \frac{1}{\sqrt{x+1}}$

3. $y = \sqrt{x^2 - 1}$

4. $y = \left(\frac{3x}{2}\right)^2$

5. $y = (x^2 - 3x + 4)^6$

6. $y = (5x - 2)^{3/2}$

In Exercises 7–44, find the derivative.

7. $y = (2x-7)^3$

9. $g(x) = 3(9x - 4)^4$

13. $f(t) = \left(\frac{1}{t-3}\right)^2$

$f(t) = (t-3)^{-2}$

$f'(t) = -2(t-3)^{-3}(1)$

$f'(t) = \frac{-2}{(t-3)^3}$

17. $f(x) = x^2(x-2)^4$

$f'(x) = x^2 \cdot 4(x-2)^3(1) + 2x(x-2)^4$

$= (x-2)^3[4x^2 + 2x^2 - 4x]$

$= (x-2)^3(6x^2 - 4x)$

21. $s(t) = \sqrt{t^2 + 2t - 1}$

25. $y = 2\sqrt{4 - x^2}$

Rewrite: $y = 2(4-x^2)^{1/2}$

Chain Rule: $y' = 2\left(\frac{1}{2}\right)(4-x^2)^{-1/2}(-2x)$

$y' = \frac{-2x}{\sqrt{4-x^2}}$

29. $y = \frac{1}{\sqrt{x+2}}$

33. $y = \dfrac{x}{\sqrt{x^2+1}}$

lo dee-hi − hi dee-lo

$$\frac{\sqrt{x^2+1}\,(1) - x\cdot\frac{1}{2}(x^2+1)^{-1/2}(2x)}{\left(\sqrt{x^2+1}\right)^2}$$

$$\frac{1}{x^2+1}\left(\frac{\sqrt{x^2+1}}{\sqrt{x^2+1}}\cdot\frac{\sqrt{x^2+1}}{1} - \frac{x^2}{\sqrt{x^2+1}}\right)$$

$$\frac{1}{x^2+1}\left(\frac{x^2+1-x^2}{(x^2+1)^{1/2}}\right)$$

$$\frac{1}{(x^2+1)^{3/2}}$$

In Exercises 45 and 46, find an equation of the tangent line to the graph of f at the given point.

Function	*Point*
45. $f(x) = \sqrt{3x^2-2}$	(3, 5)

$f(x) = (3x^2-2)^{1/2}$

$f'(x) = \frac{1}{2}(3x^2-2)^{-1/2}(6x)$

$f'(x) = \dfrac{3x}{\sqrt{3x^2-2}}$

$f'(3) \rightarrow$ slope

then $y - y_1 = m(x - x_1)$

In Exercises 47–50, find the second derivative of the given function.

47. $f(x) = 2(x^2-1)^3$ → $f'(x) = 6(x^2-1)^2(2x)$ → $f'(x) = 12x(x^2-1)^2$

f'' → use product rule or expand & use power rule.

49. $f(x) = \sqrt{x^2+x+1}$

$f(x) = (x^2+x+1)^{1/2}$

$f'(x) = \frac{1}{2}(x^2+x+1)^{-1/2}(2x+1)$

$f'(x) = (x^2+x+1)^{-1/2}\left(x+\frac{1}{2}\right)$

Product Rule: $f''(x) = \underbrace{-\frac{1}{2}(x^2+x+1)^{-3/2}(2x+1)\left(x+\frac{1}{2}\right)}_{f'\ \ g} + \underbrace{(x^2+x+1)^{-1/2}}_{f}\underbrace{(1)}_{g'}$

$$f''(x) = \frac{-\left(2x^2+2x+\frac{1}{2}\right)}{2(x^2+x+1)^{3/2}} + \frac{1}{(x^2+x+1)^{1/2}}\cdot\frac{(x^2+x+1)}{(x^2+x+1)}$$

$$f''(x) = \frac{-2\left(x^2+x+\frac{1}{4}\right)}{2(x^2+x+1)^{3/2}} + \frac{(x^2+x+1)}{(x^2+x+1)^{3/2}}$$

$$f''(x) = \frac{3}{4(x^2+x+1)^{3/2}}$$

51. Let u be a differentiable function of x. Use the fact that $|u| = \sqrt{u^2}$ to prove that

$$\frac{d}{dx}[|u|] = u' \frac{u}{|u|}, \quad u \neq 0.$$

$$\frac{d}{dx}\left[|u|\right]$$

$$\frac{d}{dx}\left[(u^2)^{1/2}\right]$$

$$= \frac{1}{2}(u^2)^{-1/2}(2u)\,u'$$

$$= \frac{u \cdot u'}{\sqrt{u^2}}$$

$$= \frac{u \cdot u'}{|u|}$$

Quiz time!

HW: Tan Review Worksheet
8 - 12 Find derivative.